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The Record

Volume 7
Number 12

A Newsletter of the Scientific Computing Division
National Center for Atmospheric Research

December 1, 1986

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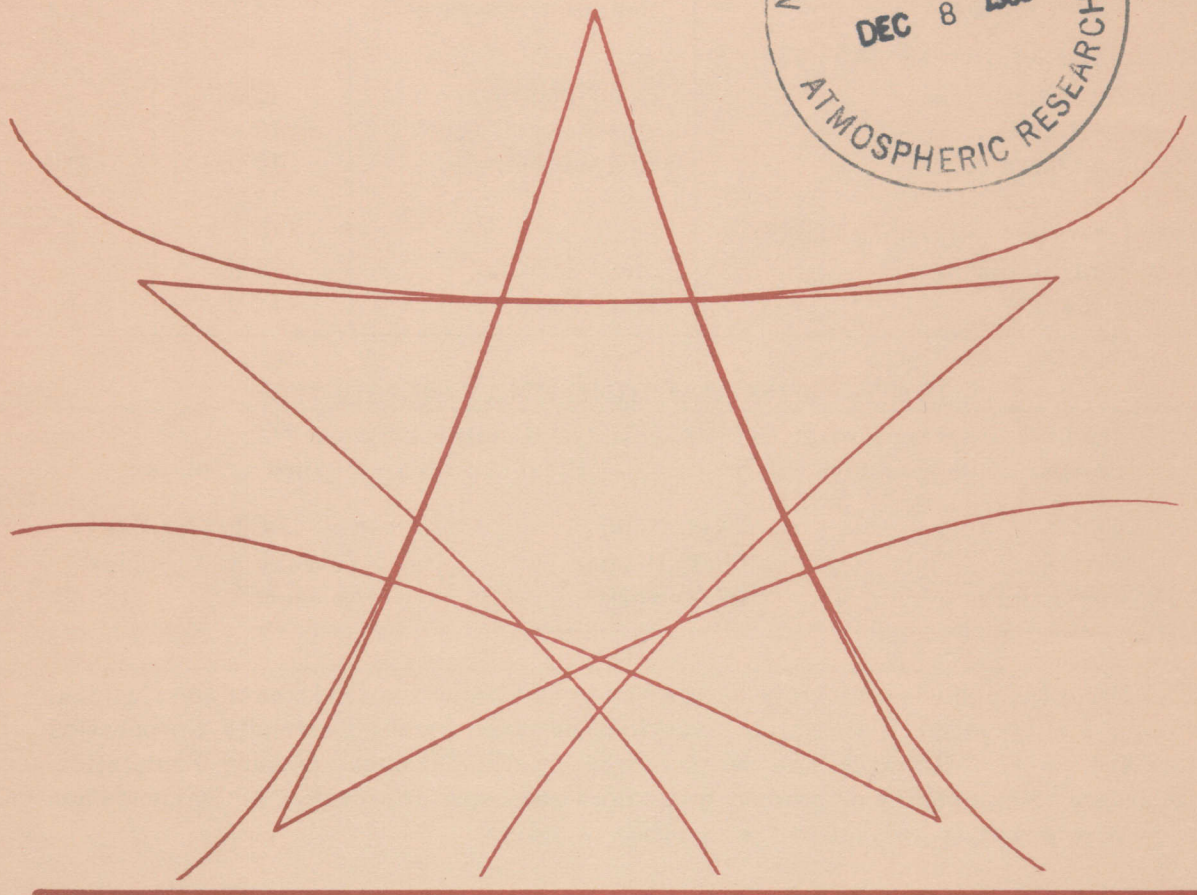

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Direct dial prefix: (303) 497-
NCAR Operator: (303) 497-1000
Consulting Office: (303) 497-1278

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SCHEDULE OF MACHINE UNAVAILABILITY

All machines may be down from 07:00 until 08:30 daily for Systems Checkout.
In addition, some machines will be down for Preventive Maintenance as follows:

CRAY,C1	06:00-08:00	Monday & Wednesday
CRAY,CX	06:00-10:00	Tuesday & Thursday
IBM 4381 (IO)	07:00-08:30	As needed

The Record is published monthly by the Scientific Computing Division of the National Center for Atmospheric Research. NCAR is operated by the University Corporation for Atmospheric Research and is sponsored by the National Science Foundation. Reference to a company or product name does not imply approval or recommendation of that company or product to the exclusion of others.

Robert Nicol, Editor
Dee Copelan, Manager, User Services
Frieda Garcia and Karen Hack, SCDUG Minutes
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Cover Graphic

The graphic on the cover of this issue was produced by the staff of *The Record* by superimposing the NCAR GKS Graphics Package demonstration plot for CURVE on itself to create a star. Season's greetings and best wishes from SCD!

Software Change Articles

All articles about changes to software that affect the computing environment are now flagged with the triple Delta insignia, as shown in the example below.

ΔΔΔ

Example of a Software Change Article Title

by An Author

These articles are also marked with a Delta sign in the Table of Contents above. Please check these flagged articles carefully for changes that affect your computing procedures.

Consulting Office Schedule for December 1986

Consulting Office hours are 08:30-11:30 and 13:00-16:00 daily, Monday through Friday. The Consulting Office is closed every Wednesday from 13:00-14:00 for staff meetings. Consultants may be reached by calling (303) 497-1278. Messages may also be sent to the CONSULT1 virtual machine on the IBM 4381 computer.

Important Note: In conjunction with the installation and testing of the new CRAY X-MP, consultants will be attending a short coordinational meeting each morning on Tuesday and Thursday. The Consulting Office will be closed from 08:40-08:55 each morning during this period.

Consultants for December are:

Ann Cowley Ken Hansen Barb Horner-Miller Mike Pernice

December 1986 Consulting Office Schedule

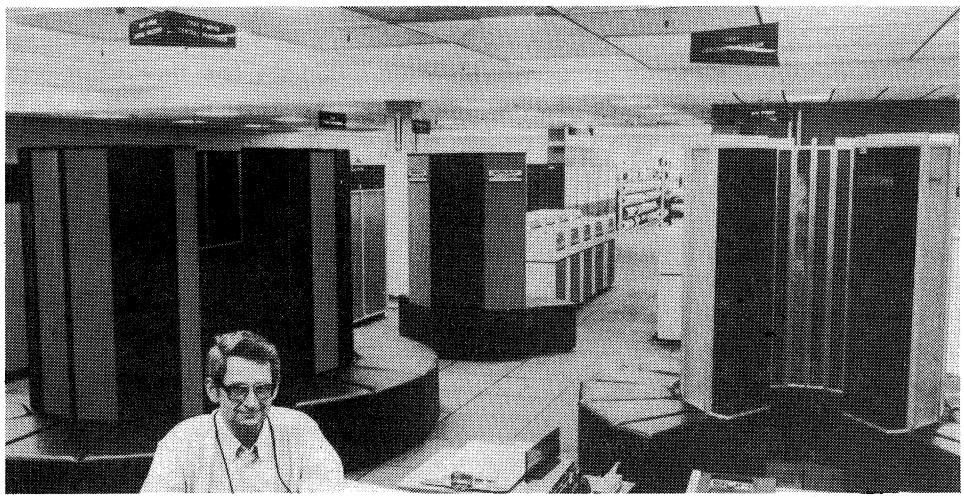
Week of	Shift	Monday	Tuesday	Wednesday	Thursday	Friday
Dec 1	A.M.	Barb H-M.	Ken H.	Ann C.	Ken H.	Barb H-M.
	P.M.	Mike P.	Ken H.	Ann C.	Ken H.	Mike P.
Dec 8	A.M.	Barb H-M.	Ken H.	Ann C.	Ken H.	Barb H-M.
	P.M.	Mike P.	Ken H.	Ann C.	Ken H.	Mike P.
Dec 15	A.M.	Barb H-M.	Ken H.	Ann C.	Ken H.	Barb H-M.
	P.M.	Mike P.	Ken H.	Ann C.	Ken H.	Mike P.
Dec 22	A.M.	Barb H-M.	Ken H.	Ann C.	HOLIDAY	HOLIDAY
	P.M.	Mike P.	Ken H.	Ann C.	HOLIDAY	HOLIDAY
Dec 29	A.M.	Barb H-M.	Ken H.	Ann C.	HOLIDAY	Ann C.
	P.M.	Barb H-M.	Ken H.	Ann C.	HOLIDAY	Barb H-M.

Don't Let Your MSS Files Be Purged!

Please see the "Mass Storage System News" column on page 25. in the *For The Record* section for important information about Mass Storage System files.

Recent Policy Changes for the CRAY,CX and CRAY,C1 Computers

As announced in the previous issue of *The Record* (November 1986), NCAR's new CRAY X-MP/48 supercomputer has arrived, and has been through the initial check-out by CRAY technicians and SCD Systems staff. During this preliminary checkout, selected users aided the Systems staff in running the new supercomputer through its paces. The CRAY,CX computer, as the X-MP has been designated, was opened to all users on Monday, November 10. The opening date had been postponed for one week due to a variety of problems with the hardware, software, and network links.



Systems Manager Paul Rotar is shown in front of NCAR's newly installed CRAY X-MP/48 supercomputer. The remaining CRAY-1 computer appears on the right.

GAU Charging on the CRAY X-MP Begins December 1

During the last three weeks, the load on the CRAY,CX computes has grown to the extent that neither the job class structure nor COS can handle it efficiently. Most users have been submitting jobs in the Foreground clasess, since there is no charging against GAU allocations. This situation has significantly reduced the throughput of jobs. For example, a 99-second job that required limited MSS and DICOMED resources stayed in the job queue for two days.

To restore throughput, SCD will begin charging against GAU allocations for the use of the CRAY,CX computer as of December 1, 1986, rather than January 1, 1987. During December, adjustments may be made to the charging algorithm, based on the use of the X-MP.

The 5 minute time restriction on the EXPRESS 2 job class that was instituted in the absence of charging will be removed December 1.

Reduced Charges on the CRAY,C1 Machine

As of December 1, charges against users' allocations for a given job run on the CRAY,C1 computer will be assessed for only 58% of the regular GAU charges for that job. The purpose of this is to make the CRAY,C1 charges approximate the charges the same job would have incurred if it ran on CRAY,CX system.

The job classes on both CRAY computers will be the same, except that there are no monoprocessing classes on the CRAY,C1 computer.

Field Length Reduction on the CRAY,C1 System

The throughput on CRAY,C1 has been severely impaired by jobs that use maximum memory and over 50% of the available disk space. This situation has prompted numerous user complaints. Further complications arose when the normal system utilities to link with the Mass Storage System and the NCAR Local Network had to be dropped out of the CRAY,C1 system until these large jobs finished.

In order to improve throughput on the CRAY,C1 machine and to encourage the movement of large jobs to the more expansive resources of the CRAY X-MP, the maximum allowable field length for any job run on the CRAY,C1 system has been reduced from 791,000 to 650,000 as of November 11. **Jobs that exceed the maximum allowable field length on the CRAY,C1 computer will be dropped.**

If you have problems converting your jobs to run on the X-MP, call the Consulting Office at (303) 497-1278.

Other NCAR CRAY X-MP News

To help our users run their first jobs on the CRAY,CX system, SCD held an introductory meeting on November 10 in the Main Seminar Room of the Mesa Laboratory to discuss the machine status and other items of interest. SCD also held a series of seminars on X-MP topics during October and November to familiarize users with the new software and hardware.

CRAY,CX First-line Consultants

To make the transition to the X-MP easier, SCD has requested experienced users to act as local consultants for staff members at their site or within their division. The following people have volunteered to answer user questions about the CRAY X-MP:

Remote Sites

Pete Guetter	U. of Wisconsin	(608) 262-0554
Roberta Young	MIT	(617) 253-0875
Joe Spahr	UCLA	(213) 825-1555
Memorie Yasuda	USC	(213) 743-6008
Clare Larkin	Penn State	(814) 863-3932

NCAR Sites

Rick Wolski	AAP	(303) 497-1330
Rolanda Garcia	ACD	(303) 497-1446
Chuck D'Ambra	ASP	(303) 497-1640
Celia Chen	ATD	(303) 497-1648
Bill Hall	CSD (RL-6)	(303) 497-8926
John Del Corral	DIR/ADMP (East Park)	(303) 441-2911
Jack Miller	HAO	(303) 497-1513

The Consulting Office is looking for volunteers from other sites. If you are interested, call (303) 497-1278.

CRAY X-MP News File

Since so many things are happening with the CRAY,CX machine, User Services staff have initiated a news file on the IBM 4381 (IO) system to keep users up to date. This file can be accessed by typing

NEWS XMP

on the IBM 4381 (IO) computer.

The following list is a summary of those news items that may be of continuing interest to you. They are organized by functional category. However, for the latest information on the CRAY,CX computer, you should check the NEWS XMP file on a regular basis before running your jobs on the new machine.

Required changes 11/10/86

Running on the X-MP requires changes to jobs running on the CRAY,C1 machine. Issue the command

HELP XMPCHANG

from the IBM 4381 to see additional documentation on how to run on the X-MP. The information contained in that HELP file is also available in the SCD document entitled "CRAY Series: Changing Your Job to Run on the X-MP." *Note: See the Documentation Update column in this issue for instructions on ordering SCD documents.*

Account statement 11/11/86

All jobs on the X-MP must have an ACCOUNT statement immediately following the JOB statement. (There cannot even be a comment statement between them.)

ACCOUNT,AC=*xxxxyyyyyyyy*.

where *xxxx* is the user number and *yyyyyyyy* is the project number. This statement is acceptable, but not required, on C1. The accounting information currently being given in the log file of your job is incorrect.

JCL Not on the X-MP 11/11/86

NETAQR and NETDISP are not available on the X-MP. They must be changed to ACQUIRE and DISPOSE statements. Please consult the documentation in *The CRAY-1 Computers: A Guide to Supercomputing at NCAR* for the form of each statement.

COPYSR, COPYSF, and COPYSD are not supported on the X-MP. The system form of the COPYR, COPYF, and COPYD commands now provide the shift option with much more flexibility than the COPYSx commands gave. See the CRAY COS 1.15 reference manual for more information on these copying commands.

FORTRAN-Callable JCL 11/10/86

The TEXT field parameters on the FORTRAN-callable JCL statements must terminate with a null character. The CRAY documentation has always specified that all fields must terminate with nulls and in Release 1.15, CRAY has enforced this policy. At NCAR, blanks or nulls may be used to terminate any parameter except TEXT field parameters. (The TEXT field may contain blanks and therefore must terminate with a null.) You can easily force a null character in several ways:

a. by appending an "L" to a Hollerith constant

b. by concatenating a null byte to the end of a character string.

c. by reading a character variable using an L format rather than an A format.

For example:

a.

```
CALL DISPOSE('TEXT'L,'FLNM=/USER/DIR/MODEL'L)
```

b.

```
CHARACTER*40 TEXT
TEXT='FLNM=/USER/DIR/MODEL'//CHAR(0)
```

c.

```
    CHARACTER*40 TEXT
    READ (5,100) TEXT
100 FORMAT (L40)
```

Job classes 11/10/86

The job class structure has changed for the X-MP. It will be changed on the C1 in December so that both machines use the same classes. The classes were defined in the November issue of *The Record.* To see the valid class structure from the IBM 4381, issue the command

```
AID 'CLASS' CRAY
```

Memory limitations 11/10/86

Jobs running on the X-MP may not use more than 6 million words of memory unless the job is running in the monoprocessing job class. X-MP jobs requiring more than 2 million words of memory must use the MFL parameter on the JOB statement. MFL is set to the (decimal) number of words of memory required by the job. At NCAR, MFL may not be specified without a value because the default value is 8 million words.

Important Note: If you use more than 4 million words of memory, you must change from LDR to SEGLDR.

Various FORTRAN errors and considerations 11/10/86

CRAY is tightening the enforcement of the FORTRAN 77 standard with each release of CFT. The following items list problems encountered by the initial group of users on the X-MP. It will be expanded as necessary during the "friendly user period". Some of these are SPRs against the compiler; many are caused by non-standard usage of FORTRAN statements. If you wish to access the 1.14 version of the compiler from the X-MP, add the following ACCESS statement in front of your (first) CFT statement:

```
ACCESS,DN=CFT,ID=V114BF5P.
```

If you do this to circumvent a problem and you are successful, please report the problem to the Consulting Office so that we may pursue a solution using CFT 1.15.

Double precision 11/10/86

You cannot fill a double precision word with a Hollerith string.

You cannot set a double precision variable using "A=0D"; you must use the form "A=0.D0".

DO loops 11/11/86

1. In executing the loop structure shown on the left, one would expect to see equivalent behavior to that shown by the loop on the right. In at lease one instance, the compiler has produced code that branches to "8 CONTINUE" rather than to the "9 CONTINUE". (The compiler does issue a warning — "POSSIBLE JUMP INTO AN INACTIVE DO LOOP".)

```
      DO 10 ...                    DO 10 ...
      DO 10 ...                    DO 9 ...
        |                            |
        |                            |
      IF (...) GO TO 10            IF (...) GO TO 9
        |                            |
        |                            |
      DO 10 ...                    DO 8 ...
        |                            |
        |                            |
   10 CONTINUE                     8 CONTINUE
                                   9 CONTINUE
                                  10 CONTINUE
```

   It should be noted that the code on the left in the above example does not conform to the FORTAN 77 standard. It is technically a branch into the range of a DO loop.

2. In at least one case the two additional lines of code shown on the right are needed to achieve the desired result. This fix will make the code execute correctly on the X-MP but does not conform to the 77 standard. It changes the loop index within the loop.

```
DO 10 I=1,250                DO 10 I=1,250
KK=J+I+M                     II=I
  :                          I=II
                             KK=J+I+M
                               :
```

3. "OPT=NOINVMOV" can be added to your CFT statement so that CFT will not attempt to move invariants out of the loop. If a loop appears to be misbehaving, you might try this. If it solves your problem, please report the problem to the Consulting Office so we may pursue it further. Note: Doing this reduces the amount of optimization done by the compiler.

4. The following loop structure generated a COMPILER ERROR (both the GO TO and the double precision are required for the failure):

```
      DO 390 LL=1,M
      L = M - LL
       |
      IF (L.EQ.0) GO TO 400
      TEST = DABS(S(L)) + DABS(S(L+1))
      ZTEST = TEST + DABS(E(L))
       |
390 CONTINUE
400 CONTINUE
```

5. The following loop structure generates bad code. The complicated IF structure and the call to a function (CONXCH, in the code) are both required for the failure. The variable ITT3 is never put into storage, but when control is returned following the call to CONXCH, the compiler does a fetch for ITT3.

```
      DO 310 JP2=JPMX,NLO
       |
      IT = IPL(JP2*3)
       |
      ITT3 = IT*3
       | (use ITT3 as an index to an array)
      IF (complicated conditional check) GO TO 300
       | (use ITT3 as an index to an array)
      IF (another complicated conditional check) GO TO 300
       | (use ITT3 as an index to an array)
300 IF (CONXCH(..) .EQ. 0) GO TO 310
       | (Use ITT3 as an index to an array)
310 CONTINUE
```

Graphics 11/11/86

There are known problems with CONREC. The contours may be "scrunched" together. The line containing the contour label information that normally appears under the plot can be placed in other locations on the frame. All of these problems will be solved as soon as possible.

If you are using the VMSTA software, the form of the DISPOSE varies from that used to go to the DICOMED or back to your IBM reader from CXJOB. There is a discussion of this in the VMSTATION section below.

The DICOMED is being overwelmed with data as a result of the large number of jobs running on the X-MP and the fact that I/O resources have not increased proportionally. At this time (November 11), the Job Queue Manager is holding jobs that need the DICOMED. You can run a job to DISPOSE the $PLT file to the MSS, and then retrieve the file later and stage it to the DICOMED processors.

Miscellaneous 11/10/86

An error message to the effect that your JOB statement is missing can be caused by not having your ACCOUNT statement as the second statement in the job. You may not place a comment between the JOB and ACCOUNT statements. It might be that the US and AC fields are not the same, or it might be that your job has a \EOD statement followed by a \EOF.

The code "NED(1,M) = NED(1,M).OR.'00000000' " produces the following error message: "HOLLERITH CONSTANT > EIGHT CHARACTERS". Putting the constant "00000000" into a variable fixes the problem.

You may not do an internal read if the internal unit identifier is greater than 152 characters. You must use the substring feature of FORTRAN 77 instead. For example:

```
CHARACTER BUFFER*300, PART(20)
READ (BUFFER,'(I20)') IVAL
```

The READ will have to be replaced by the following:

```
PART=BUFFER(1:20)
READ (PART,'(I20)') IVAL
```

Charges are additive for each processor a job is using. For example, a job that uses 20 seconds on two processor will incur a 40 second charge.

There is currently a bug in the MSS software that resets the retention time parameter to one (RT=1). The circumstances of this are unknown at this time, but the situation is being carefully monitored. These datasets will not be deleted by the system in one day; instead, the retention period will be adjusted by the purge program. Until this situation is resolved, you should not assume that a test dataset on which you set a 1 day retention period will be deleted by the system. If you want it deleted, you must delete it using MSDELET from the CRAY or MSDELETE from the IBM.

VMSTATION (the interactive CRAY software) 11/10/86

The VMSTATION user should be familiar with the RECEIVE command, which is documented in the CMS Command and Reference Manual. PEEK, NOTE, and RDRLIST are part of this package dealing with spool files in the standard IBM network format. Non-IBM vendor software that interfaces to IBM software uses this form of communication. Both the VMSTATION and the TCP/IP protocol use this package.

If you are disposing metacode to the VMSTA, you must use the following form of the DISPOSE statement:

```
DISPOSE,DN=$PLT,DC=PU,DF=BB,TEXT='LRECL=1440,NET=YES'.
```

Once the file is on your IBM virtual reader, you must use RECEIVE, not RDR, to read the file. Type:

HELP RECEIVE

to display the necessary information. Note that the DF parameter must be set to BB, and not BI in the DISPOSE statement. To send this metacode to the DICOMED directly from your reader, use the SENDD1 command. Type:

HELP SENDD1

for information.

If you are using the interactive feature of VMSTA and you enter your own JCL statements rather than using the C and L commands to compile and load your job, you must RELEASE and DELETE the dataset you are compiling each time you wish to change and re-compile it. If you use the C and L commands in VMSTA, this will be done for you.

You may find CRAY PROCs (Procedures) very useful if you are entering JCL line-by-line from the VMSTA. Procedures are discussed in the COS manual and in the SCD manual entitled *The CRAY-1 Computers: A Guide to Supercomputing at NCAR.*

All tape connections to the CRAY X-MP for the next few months will be through the VMSTATION. See the VMSTATION documentation for details.

Mass Storage System 11/11/86

The users' request that the FLNM, rather than the PDN and ID fields, be printed on the accounting sheets for ACQUIREs and DISPOSEs has been put in the work queue. At this time, no estimated date for this modification is available.

Additional Note: The DICOMED graphics processors have been unable to keep up with the demand for film and fiche because of various production problems. Due to the great numbers of very large graphics metacode files that have been generated on the CRAY,CX system, the DICOMED processors were overwhelmed when the network connection was completed between the DICOMED PDP 11/34 control processor and the CRAY,CX machine, and the limited disk space available on that controller was continuously flooded with data. To alleviate this problem, the network connection has been temporarily disabled. Users who wish to run graphics jobs on the CRAY,CX system must save their metacode files by storing them on the MSS for processing at a later time. SCD staff members are studying ways to alleviate this problem on a more permanent basis.

The DROPJQ procedure to drop jobs from the CRAY,CX job queue is now available on the CRAY,CX computer and the IBM 4381 (IO) front-end system. DROPJQ functions the same way as on the CRAY,C1 machine.

If you have questions on any of the above items, please contact the Consulting Office at (303) 497-1278.

News on NCAR Graphics and GKS

by Bob Lackman

NCAR Graphics

The User Services Software Product Development Group is currently upgrading the NCAR Graphics Package to conform to the FORTRAN 77 and Graphical Kernel System (GKS) standards. During this transition period, two distinct versions of NCAR Graphics will be residing on computer systems at NCAR. For the purposes of this article, the pre-GKS version is referred to as the "old" NCAR Graphics Package, while the GKS version is designated as the "new" package.

NCAR GKS Software Release Status

Beginning in August 1986, SCD distributed Release 1 of the GKS version of the NCAR Graphics Package, which included a software tape and User Manual. The GKS version of the NCAR Package represents a major step toward standardization of the software. This new version includes the 23,000 line Computer Graphics Metafile (CGM) translator package, the System Plot Package Simulator (SPPS), and the Level 0A GKS package. In addition, SCD staff have recoded the full set of high-level utilities and test drivers to comply with the FORTRAN 77 and GKS standards.

However, this initial release has produced a major demand for consulting support in such areas as installing the package on a diverse set of computers, installing the CGM translator and making it drive various plotting devices, building GRAPHCAP and FONTCAP tables for plotting devices when these tables do not currently exist, writing and installing the low level machine dependent primitives which are required for the package to run efficiently, and taking trouble reports, especially with respect to the new translator.

As a result of these demands, **SCD is suspending distribution of Release 1**. Graphics staff are currently preparing an enhanced version, Release 2, for distribution in Spring 1987. SCD is not currently accepting any orders for the GKS package. Any orders that SCD receives from November 14 through mid-April 1987 will be returned to the requesting party with a cover letter that recommends re-ordering after May 1, 1987. Orders received after mid-April 1987 will be held until Release 2 is ready for distribution.

Due to the degree of difficulty associated with the installation of Release 1 of NCAR GKS graphics, those sites which have already received a Release 1 tape will be provided a free copy of the Release 2 tape when it becomes available; that free copy will include all documentation updates.

Release 2 Software Development

During the next several months, staff will be preparing the Release 2 package, which will contain the following additions and improvements:

- An Implementor's Guide.

  This guide will give a step-by-step procedure for installation of the package on a "generic" system.

- An updated translator reference document.

  This document will explain what the CGM translator is, what it does, and how it does it. The document will also explain how GRAPHCAPs and FONTCAPs are generated for generic plotting devices.

- An updated version of the translator.
- Software fixes for all trouble reports received to date.
- Examples of the required set of machine-dependent primitives for VMS, CMS, UNIX, and COS-based machines.

Current plans call for distribution of Release 2 of the "generic" version of the package, beginning in Spring 1987.

DEC VAX/VMS NCAR GKS Graphics Package

Staff members of NCAR's Atmospheric and Analysis Prediction Division (AAP) have produced an implementation package of the NCAR GKS graphics software for Digital Equipment Corp. (DEC) VAX computers running the VMS operating system. Although SCD has suspended distribution of the "generic" NCAR GKS Graphics Package, a Release 1 version specifically modifed for DEC VAX/VMS machines is currently available from AAP for $200.00. This package includes a ½-inch tape containing the software, a copy of the NCAR GKS Graphics Manual, and special supplemental documentation for VAX/VMS implementations.

Ordering Instructions

IMPORTANT NOTE: To purchase the NCAR GKS software package, you must first obtain an order form and purchase agreement from the address shown below. All orders MUST be accompanied by a signed purchase agreement. Any orders that do not follow these procedures will be returned. Please allow a minimum of six weeks for delivery after receipt of the signed purchase agreement and prepaid check. If a large number of orders are requested as a result of this article, delivery time may be substantially longer.

To procure an order form and purchase agreement, please write:

Mesoscale Research Section
Atmospheric Analysis and Prediction Division
National Center for Atmospheric Research
P.O. Box 3000
Attn: Pat Waukau — GKS Software Distribution
Boulder, CO 80307-3000

Commercial GKS Software Available

As a service to NCAR/UCAR, the Software Product Development Group has arranged special pricing with commercial software suppliers on GKS products for NCAR/UCAR member institutions. Reductions of up to 50% off the already low educational discount price are now available for a variety of products. At the time of this writing, the following products are available at reduced prices **to NCAR/UCAR members only**:

Supplier	Product
ISSCO 4186 Sorrento Valley Blvd. San Diego, Ca. 92121 Attn: Laura Reed	Level 2B GKS Package $1,200 / machine (Any machine) All device drivers no additional charge. Includes no maintenance or consulting.
GRAL/TEMPLATE 9645 Scranton Road San Diego, Ca. 92121	Level 2B GKS Package Dual pricing (with and without maintenance). Hot line consulting with maintenance option. Choice of two device drivers.

Computer Class	Type (Examples)	2 Yr. Support	No Support
I	Cray-1, X-MP, Cray-II	$3,000	$1,500
II	IBM 309x, IBM 308x	2,700	1,400
III	VAX 8600/8800, IBM 43xx	2,500	1,200
IV	VAX 11/750, VAX 11/780	2,100	1,000
V	VAX 11/730, PDP 11/xx	1,500	800
WS	SUN, APOLLO, MVAX-II	1,000	500

University of Lowell Research Foundation Lowell, Ma. 01854	Level 2B GKS Package FORTRAN Source Code $500 per first machine type $200 per additional machine type

To obtain a price list for the above software, you can request the SCD document entitled "Discount GKS Software Price List for NCAR/UCAR Members" from this address:

Scientific Computing Division
National Center for Atmospheric Research
P.O. Box 3000
Attn: Mary Buck — GKS Price List
Boulder, CO 80307-3000

GKS Software at NCAR

SCD has purchased the GRAL/TEMPLATE software and it is now available for use on the CRAY,CX and CRAY,C1 machines. For access instructions, contact Richard Valent, CRAY Software Librarian, at (303) 497-1302. SCD has also purchased several copies of the GRAL/TEMPLATE software for use on SCD front-end computers and workstations.

Several of the NCAR divisions and SCD are currently evaluating the software product from the University of Lowell. More information on this product will be published in *The Record* as it becomes available.

Status of GKS on the NCAR CRAY Computers

During the next several months, User Services staff will be testing various combinations of GKS software with the GKS-based NCAR utilities. There are currently three possible combinations. The utilities could be run with the NCAR Level 0A GKS software, the University of Lowell Level 2B GKS software, or the GRAL/TEMPLATE Level 2B GKS software. An article will be published in a future issue of *The Record* after this test period to discuss the test results and present the JCL needed to access these libraries for use on the CRAY,C1 and CRAY,CX computers.

The SCD Systems Section plans to implement a new metacode translator for the DICOMED graphics plotter on the Mass Store Control Processor (MSCP) in January or February 1987. Systems staff estimate that a GRAPHCAP for the XEROX 4050 laser printers should be available at about the same time. User Services hopes to have a stable set of GKS libraries available by then as well.

Although we have tried to make the conversion to GKS as transparent as possible, there are a number of changes which may be required in user codes which call current plot primitives. Users may elect to either access the pre-GKS version, or convert their codes to be compatible with the GKS version. Documentation on the conversion process is available in the SCD document entitled "GKS Conversion Guide" (see the Documentation Update column in this issue for instructions on ordering SCD documentation). Announcements concerning the GKS-based libraries will be advertised in the Daily Bulletin and *The Record* as they become available.

During the remainder of fiscal 1987 we anticipate that a considerable percentage of staff time will be directed toward providing consulting service for the new package, fixing bugs, and helping users convert their graphical codes from dependence on the old package to GKS.

Why Implement GKS at NCAR?

SCD is implementing GKS at NCAR for several reasons. The first is simply to stay current with the ANSI and ISO graphics standards. The creation, acceptance, and implementation of standards is an important part of reducing the complex maze which characterizes most current distributed computing environments. A second reason is to allow SCD to acquire related graphics products from commercial sources. We are providing a choice of several GKS products, as well as the GKS-based NCAR utilities. We will also continue to survey the commercial and public-domain arenas for other high-level GKS utility packages. The final and perhaps most important reason is to supply the foundation for future upgrades to the functionality of the utilities in a coherent and standard-conforming manner.

Why Upgrade the NCAR Utilities?

At the June 1986 SCD User Conference, interested users strongly recommended that SCD enhance the NCAR utilities. This view was also expressed by the SCD Strategic Planning Committee. Specific enhancements cited on pages 22 and 23 of that report include:

- A consistent, integrated, flexible contouring package that would include facilities for color and area fill.
- A portable facility for the display of raster image data.
- Facilities for building interactive graphics applications for data analysis.

- A consistent set of utilities for displaying 3-dimensional objects.
- Portable software for solid image synthesis.
- Animation utilities.
- Distributed graphics systems.

The recommendations specified that SCD develop these capabilities for the NCAR software rather than acquiring them from commercial vendors, based upon the following factors:

- The NCAR Graphics Package is portable.

  This means that a scientist can run the same graphics on NCAR's equipment and on central or departmental computers at one or more universities.

- The NCAR software is discipline-oriented.

  The utilities at NCAR grew out of an environment in which a major pool of application programmers were directly assigned to scientists. The graphical utilities developed to display meteorological data were later generalized, written in portable form, and collected into a graphics library.

- SCD provides the FORTRAN source code for the package at no extra cost.

  This feature has allowed the scientific projects to easily extend the current functionality to suit their specific needs. Prototype extensions to the existing utilities are currently being developed within a number of the scientific projects. Further extensions to the NCAR graphical library will originate from this source. Software vendors do not ordinarily supply source code, except at great additional cost.

- The NCAR Graphics Package is inexpensive.

  At a cost of $200 for software and documentation, the NCAR package can be ported to any colleague at any university without great impact on limited departmental budgets.

Opportunities for Upgrades

With the limited number of staff who are working on NCAR graphics, it would take many years to implement the list of enhancements contained in the SCD Strategic Planning Report; however, SCD is exploring a number of different development alternatives.

1. The NCAR Graphics Package has recently been accepted as the basis for the addition of a plotting capability into the SLATEC mathematical library. Six DOE laboratories, the NSF Supercomputer Centers, NCAR, and New York University have joined in a collaborative effort to accomplish this goal. The creation of a new graphical utility by any of the consortium members will automatically be compatible with the NCAR environment. Moreover, any addition to the SLATEC library will be available to NCAR/UCAR sites at a fraction of the cost of commercial graphical software.
2. SCD is pursuing a possible collaboration with UCAR and private industry for graphical development as part of the new UCAR Corporate Affiliates Program.

3. SCD is requesting bids for major commercial packages such as DI-3000 and DISSPLA. NCAR and UCAR management will be presented with a list of options and associated costs. We welcome any suggestions that you may have regarding commercial packages for evaluation; please send them to:

   Scientific Computing Division
   National Center for Atmospheric Research
   P.O. Box 3000
   Attn: Bob Lackman — GKS Software
   Boulder, CO 80307-3000

   or send electronic mail to: rll@scdsw1.arpa or TO RLL on the IBM 4381 (IO) system. The actual selection of software will depend upon a number of factors, including approval at various levels; however, we would greatly appreciate any aid that you can provide in compiling the preliminary list.

Bob Lackman leads the Software Product Development Group in the User Services Section of SCD.

Cray User Group Meeting Report

by Michael Pernice

The Cray User Group (CUG) held its fall meeting this year at Garmisch-Partenkirchen, West Germany, from September 29 to October 3. (The next CUG meeting will be held in April 1987, in New York City.) The theme of the meeting was *Applications and Algorithms.* Over 200 attendees from over 50 CRAY sites participated, as well as several representatives from CRAY Research, Inc. Three representatives from the Scientific Computing Division at NCAR attended the meeting: Gary Jensen, Manager of the Operations Section and chairman of the CUG Operations Special Interest Committee (SIC); Karen Friedman, a technical writer in the Systems Section and Secretary of the CUG Board of Directors; and myself, a consultant and programmer in the User Services Section.

Participants discussed a wide variety of issues during the 3½ day meeting. Topics included FORTRAN I/O performance, issues in multitasking, performance and features of CRI operating systems and compilers, development and performance of numerical algorithms and application programs, and communications issues.

Representatives from CRAY Research and various CRAY sites presented papers and reports. I presented a paper entitled "Solving Sparse Non-Symmetric Linear Systems on a CRAY-1 using a Preconditioned Krylov Subspace Method" at one of the Applications and Algorithms Sessions, and attended the general sessions, the Software Tools SIC meeting, the Applications and Algorithms sessions, and most of the Performance and Software Tools sessions.

Due to the amount of information that I gained at this CUG meeting, I have not attempted to summarize everything in this article, since it would be too long for *The Record* or would omit too many important details to be of any use to the NCAR user community. Instead, I will pass on the information I gathered concerning two topics that will affect the NCAR user community in the near future: the UNICOS operating system, and the new CFT77 compiler. If you would like information on the other topics listed above, please feel free to contact me at (303) 497-1238.

UNICOS

UNICOS is a UNIX-based operating system, written in C, that CRAY Research has been developing for the past two years. Based on AT&T's UNIX™ System V, UNICOS is central to CRAY Research's goal of developing a uniform environment on all of its mainframe computers. CRAY Research maintains that such a uniform environment eases program migration from one CRAY system to another. Currently, UNICOS is running on all CRAY-2 systems and on some X-MP systems. The CRAY X-MP can also run in a dual operating system environment, in which COS runs on some of the multiple processors and UNICOS runs on the others as a Guest Operating System (GOS). Due to differences in COS and UNICOS file formats, running a GOS on an X-MP requires partitioning of all the system resources, including processors, central memory, I/O subsystem, disk drives and SSD.

At the meeting, CRAY Research representatives stated that COS development will be frozen at the 1.16 release as part of the plans to provide a uniform environment. In other words, no new functionality will be added to COS, but identified bugs will be fixed. COS 1.16 is scheduled for release in February, 1987. Development activity, such as new features and performance tuning, will be restricted to UNICOS. Consequently, SCD is considering plans to install UNICOS as a GOS on NCAR's X-MP and eventually migrate to a pure UNICOS environment; however, no definite schedule has yet been established for this migration. Differences between COS and UNICOS that will affect the NCAR user community began to emerge at the fall CUG meeting. These differences will be described next.

Currently only two CRAY sites run UNICOS as a GOS on an X-MP. Bell Laboratories, in Murray Hill, New Jersey, is running it on a two-processor X-MP. System resources are evenly divided between COS and UNICOS on weekdays. On weekends they run a pure COS environment on one day and a pure UNICOS environment on the other. UNICOS will accept batch commands, and can be run as an interactive operating system and a batch operating system simultaneously. Since their staff is already well-versed in UNIX, Bell Labs has experienced few problems in making the transition from COS to UNICOS. A.E.R.E. Harwell has also installed UNICOS on one processor of a two processor X-MP to serve as a transitional environment for a CRAY-2. They run both COS and UNICOS at all times.

UNICOS Performance

CRAY Research presented the results of several performance tests that compare COS 1.16 and a pre-release version of UNICOS 2.0. CRAY ran these tests on a two processor X-MP with 16 million words of main memory, a 32-million-word SSD, and 2 DD-49 disk drives. All of the tests were performed on a dedicated machine; the benchmark programs were the only jobs running on the machine during the tests.

Two CPU-intensive application programs, which CRAY Research acquired from CRAY users for the specific purpose of obtaining benchmarks, showed roughly the same performance under both operating systems. Likewise, two I/O-intensive jobs, using FORTRAN READ statements from datasets on the DD-49 disks, performed similarly under the two environments. The I/O performance result must be further qualified by noting that the datasets being read were contiguous on the disks; in other words, they were not fragmented over several disk sectors, as is often the case with data on NCAR's DD-19 disk drives that are connected to the CRAY-1 system.

The analysis included system call-time comparisons. In one test, the process ID of a job was obtained by making a call to the system; in the other, the amount of time required to switch processes (interrupt a running process, disconnect it from a physical CPU, and connect another process to a physical CPU) was measured. In both tests, UNICOS showed a gain of a factor of approximately 2.7 over COS.

The tests also compared performance of the SSD under COS and UNICOS. UNICOS consistently out-performed COS, by factors ranging from about 1.24 to 4.59 for sequential unformatted I/O of datasets on the SSD. However, the true significance of this improvement may not be apparent in the figures. In order to approach the theoretical maximum transmission rate between the SSD and main memory, large amounts of data must be transferred in order to compensate for system start-up time. The results presented by CRAY Research showed that under UNICOS there is much less system overhead and higher transmission rates were obtainable with smaller amounts of data.

UNICOS 2.0 provides an additional feature, called Secondary Data Segments (SDS), that allows the system to treat the SSD as an extended memory device rather than as a fast disk. UNICOS 2.0 implements this feature in a set of system calls; future releases of UNICOS will make this feature available through FORTRAN READ and WRITE statements. It allows the use of direct access files on the SSD. (Direct access files on the SSD are not allowed under COS, and representatives of CRAY Research stated at the CUG meeting that there were no plans to include this feature.) Because of this, a strict comparison between COS and UNICOS cannot be made; however, use of the UNICOS SDS feature resulted in SSD/main memory transfer rates 2.18 to 25.66 times those obtained using COS. Again, the greatest gains were made when smaller amounts of data were transferred. These tests demonstrated the greater efficiency of UNICOS over COS in setting up data transfers between central memory and the SSD.

Because of the circumstances of these tests, their relevance to the batch computing environment at NCAR is unclear. However, the fact that UNICOS provides for direct access files on the SSD and introduces much lower system overhead for SSD data transfers gives it a distinct edge over COS.

Program Migration to the UNICOS Environment

Migration of application programs from COS to UNICOS requires modification of both the Job Control Language (JCL) segment and the FORTRAN source code segment. In general, COS JCL statements must be replaced by UNICOS commands. This applies to FORTRAN-callable JCL as well. One exception is the UPDATE utility, which will be fully supported in UNICOS. CRAY Research has also written a migration tool called PLCOPY, which will copy a program library created under COS into a program library that can be used by the UNICOS version of UPDATE.

CRAY Research plans several other migration tools to facilitate the transition from COS to UNICOS. One such tool, still under development, will help to translate a block of COS JCL statements into a block of UNICOS commands. This tool is intended to be a migration aid only and will be supported by CRAY Research for only a limited period of time.

Another migration tool planned by CRAY Research will ease the transition from LDR under COS to SEGLDR under UNICOS. LDR is the JCL statement used to load, link, and run compiled programs. SEGLDR, already available in COS, has a similar functionality and will be the only loader available under UNICOS. CRAY Research's own experience in code migration

has shown that applications that make extensive use of the LDR overlay feature are difficult to migrate. Consequently, they are developing a utility, called LD2, which will read an input file of LDR directives, translate them to SEGLDR directives, and execute a SEGLDR command with the translated set of directives.

CRAY Research plans to include other non-UNIX COS commands in UNICOS, such as PREMULT (a preprocessor necessary for microtasking) and FTREF (a utility for analyzing module and common block dependencies in a FORTRAN program). The program debugging aids DEBUG, SYMDEBUG, DRD (Dynamic Runtime Debugger, similar in functionality to SID) and DDA will also be included in UNICOS as well as COS.

The COS JCL statements ACCESS, ACQUIRE, and SAVE will not have UNICOS counterparts. The distinction between "permanent" and "local" datasets is not made in UNICOS. Files that are to be used in an application program running under UNICOS should be created using a FORTRAN OPEN statement. Such files should also be CLOSEd prior to program termination. However, certain important features of the ASSIGN statement (such as defining a file to be stored on the SSD) are absent from UNICOS. CRAY Research is studying ways to include these features in future versions of UNICOS, and is also developing a UNICOS version of a network file server, which will make datasets on remote mass storage accessible to jobs running under UNICOS.

CRAY Research recommends that migration of FORTRAN code be done in stages. The application program should first be running correctly under COS 1.15, using the CFT 1.15 compiler and SEGLDR instead of LDR. The next step is to substitute the CFT77 compiler for CFT. Finally, the application program must be modified to run under UNICOS.

Differences in the way COS and UNICOS handle files must be dealt with. Multiple-file datasets are not supported under UNICOS. File position is not preserved across job steps, as in COS. Instead UNICOS performs automatic rewinds. However, as mentioned above, UNICOS will allow direct access files on the SSD, while COS does not.

CRAY Research has been working on migrating codes from COS to UNICOS in order to gain experience, provide documentation and training aids, and identify problem areas where migration tools would be helpful. This activity has already resulted in the migration tools mentioned above, as well as improved performance of UNICOS 2.0 over previous releases. Their experience has shown that the easiest FORTRAN application programs to migrate are computationally-intensive, clean, well-structured and well-documented, and require only simple I/O. CRAY Research is also developing a self-paced, hands-on tutorial for new users of UNICOS.

One unresolved problem that exists in UNICOS involves inter-language communication. Such problems occur when, for example, a FORTRAN program calls another module that was written in C or PASCAL. The problem can appear when calls are made from a FORTRAN program to UNICOS, which is written in C. The example that was presented at the CUG meeting involved use of lower-case FORTRAN source code that used an OPEN statement to create a file. This problem arises primarily because there is no widely-agreed upon industry standard for inter-language communication. CRAY Research is working on developing and enforcing an internal standard.

CUG is considering creating a SIC on UNICOS migration.

CFT77

As part of its effort to establish a uniform environment on all of its mainframes, CRAY Research released its new compiler, CFT77, this past summer. CFT77 is written in PASCAL, and is intended to replace CFT; consequently all future development will be concentrated in CFT77 and representatives of CRAY Research stated at the CUG meeting that CFT will be frozen at the 1.16 release. CFT 1.16 is scheduled for release in June, 1987. Using CFT77 should be relatively easy: CRAY Research maintains that, in general, all codes that compile and execute correctly under CFT will also do so under CFT77. Version 1.3 of CFT77 will run on a CRAY-1, and is scheduled for release later this year.

CFT77 conforms to FORTRAN 77 conventions, and includes some FORTRAN 8x extensions such as array processing, as well as CRAY Research "standard" extensions like NAMELIST. CFT77 provides the same automatic vectorization features as CFT. Early field reports indicate, however, that there are loops that CFT 1.15 vectorizes but CFT77 does not. CRAY Research wants to know about such loops, and wants CFT77 to vectorize everything vectorized by CFT. There are also some loops that vectorize under CFT77 but not under CFT.

CFT77 supports multitasking on the X-MP at both the macrotasking and microtasking level, just as CFT does. There are plans for eliminating the need to use the PREMULT preprocessor for microtasking with CFT77, and CRAY Research also promised an "autotasking" feature in CFT77 sometime before mid-1987. Autotasking involves automatic dependency analysis and partitioning of scalar loops without user intervention. This is analagous to automatic vectorization and should be contrasted with microtasking, which provides a similar facility through the use of compiler directives and the PREMULT preprocessor. Microtasking requires the user to analyze data dependencies. Autotasking is not planned for future releases of CFT.

The major differences between the CFT and CFT77 compilers lie in scalar optimization and design philosophy. CFT divides program units into smaller units, called blocks, and then attempts to optimize the instructions within each block. These blocks have a default size, which may be changed by the user with the MAXBLOCK keyword on the CFT JCL statement. A user may also specify the location of a block boundary with the BLOCK compiler directive. Aside from user determination of the size and location of blocks, the division of a program unit into blocks by CFT is completely arbitrary. Scalar optimization occurs solely within each block, and information generated in one block that might be useful for optimizing a later code segment is not shared across blocks. Consequently, full scalar optimization on a program unit level is hard to achieve with CFT. CFT77 solves this problem by performing global scalar optimization. CFT77-generated code may run 10-30% faster than CFT-generated code, depending on how much scalar work is performed.

The analysis required to do global optimization is much more costly than the piecewise optimization done by CFT. Field reports have indicated that compile times under CFT77 can be 10-15 times greater than under CFT. CRAY Research has a goal to reduce this to a factor of 2-4. There is also a feature that allows the user to disable the global optimization feature, which results in compile times comparable to CFT.

Its modular structure should provide for simple upgrades of any portion of the compiler without affecting other parts of the compiler. CFT is notorious for lacking such structure, which led to many of the problems encountered by users when moving from one version of CFT to another. CFT77's modular structure also provides a development base for CRAY Research to write optimizing compilers for other languages, such as C and PASCAL.

Michael Pernice is a programmer and consultant in the User Services Section of SCD.

How the CVMGx Functions Work

Editor's Note: The following article was written by Peggy Boike and Dick Henderickson of the Compilers and Products section of CRAY Research Inc., and was originally published in the February 1986 issue of the CRAY Software Division Newsletter under the same title. Barbara Horner-Miller of the User Services Consulting and Technical Support Group recommended that it be republished in The Record *to help NCAR users resolve continuing problems with the use of CVMGx functions. We extend our thanks to CRAY Research, Inc. for permission to republish the article.*

How The CCVMGx Functions Work

Recently there have been several SPR's written that all purport to report problems with the various CVMGx functions. These SPR's are almost always incorrect. The CVMGx functions almost always work the way they were designed to work (they were designed by a customer). The problem is that users think that the functions are generic. THEY ARE NOT! THEY ARE BOOLEAN! Thus the function

```
CVMGT(1.0, 2.0, .TRUE.)
```

does not return the value "1.0", it returns a bit pattern, which, if used in a floating point operation, acts just like a "1.0". However, if it's used as an integer it's a huge one and if used like a character string it's mostly unprintable.

What does all of this mean? The tricky parts come when the CVMGx functions are used. Given a statement like

```
X=CVMGT(...)
```

the function is evaluated, the BOOLEAN result is interpreted as a real number for the store into X. No explicit type conversion is performed, regardless of the types of the operands to CVMGT. Similarly, in an expession like

```
X=CVMGT(A,B,LOGIC1) + CVMGT(C,D,LOGIC2)
```

the two functions are evaluated and produce BOOLEAN results. Boolean operands are combined using INTEGER arithmetic. Thus, in this example, an integer add is performed, producing a Boolean result which is then stored into X without any explicit type conversion. (Implementations prior to 1.15 actually were inconsistent and sometimes treated the sum as integer and then did an explicit float before the store. Now, a low level warning message is issued whenever two Boolean operands are combined in an expression and the result is possibly different from the previous versions). (If you think Boolean operands should be added using floating point addition, think about 1Rx + 1b. If you think we should use the obvious method think about X + 1000000000000000b).

There are five simple guidelines for using the CVMGx functions:

1. DON'T. With CFT use the OPT=PARTIALIFCON compile time option. This causes CFT to compile one line IFs as if they had been replaced with CVMGx's. However, the compiler worries about the type.
2. If you must use them, don't use more than one in an expression.

3. If you must use more than one in an expression, use explicit type conversion functions.

   REAL (CVMGT(1.0, 2.0, LTEST)) + REAL (CVMGT(X, Y, LTEST2))

4. Make sure that the assignment type and function argument types match. Use:

   X=CVMGT(1.0, 2.0, LTEST)

   or even

   X=IFIX (CVMGT(1, 2, LTEST))

   not

   X=CVMGT(1,2,LTEST)

5. Don't even think about things like

   CVMGT (1, 2.0, LOGICAL)

Finally, if people think they are generic and want them to be generic, why don't we make them generic? We probably should have, but when they were implemented, the generic concept wasn't in CFT. We can't change them now without potentially invalidating lots of old working programs.

Change to OPTION Entries in $NCARLB and LOCLIB on 11/06/86

by Richard Valent

There are two versions of entry OPTION residing in libraries on the NCAR CRAY computers. One version is provided by CRAY, and resides in the system library $SYSLIB. The other version is provided by SCD, and resides in the NCAR System Plot Package (NSPP). These two entries are unrelated: users specify CRAY job options with the former, and plot options with the latter. If you inadvertantly use the wrong entry, it will cause incorrect printout or plots, and may result in a flood of USER GP002 error messages in your CRAY LOG file.

This naming conflict has become a problem due to changes in COS Version 1.15. The default library search order in COS 1.15 no longer looks for routines in $NCARLB before checking $SYSLIB. A temporary fix is easily implemented (see below), but for the longer-term, we recommend changing calls to the NSPP OPTION routine.

Scope

LOCLIB is the only SCD-supported source library at NCAR that uses the NSPP OPTION call. $NCARLB is the only SCD-supported relocatable library that uses the NSPP OPTION call. Within LOCLIB, the NSPP OPTION entry is located in package PLOT88, and packages that contain NSPP OPTION calls are:

CONRECSMTH	CTRINT	PREPA
CONRECSUPR	FDPACN	PWRX
CONREC	FDPACR	THREED

Solution

User Services has replaced the NSPP OPTION calls in the LOCLIB and $NCARLB libraries with OPTN calls on both CRAY computers. The NSPP OPTION has been changed in PLOT88 to issue a message in the CRAY job log file warning that the NSPP OPTION entry will be removed on December 17. **Important Note: This change will be made on both of the CRAY computers.**

Users can avoid problems in the immediate future by specifying LIB=$NCARLB on LDR and SEGLDR control statements in CRAY jobs using the NSPP OPTION routine. Users should follow this action by replacing NSSP OPTION calls with OPTN calls, using the following code as a guideline:

```
SUBROUTINE OPTION (ICAS, INT, ITAL, IOR)
CALL OPTN ('CASE', ICAS)
IF (INT .EQ. 0) CALL OPTN ('INTN', 'LOW')
IF (INT .EQ. 1) CALL OPTN ('INTN', 'HIGH')
CALL OPTN ('FONT', ITAL)
CALL OPTN ('OREN', IOR)
RETURN
END
```

Richard Valent is a CRAY software librarian in the User Services Section of SCD.

Mass Storage System News

Important Notice

There are approximately 14,000 data files on the Mass Storage System (MSS) that have not been accessed in any way by any user since SCD staff transferred them from the old TBM system to the MSS. All of these files are stored on the MSS with the pathname /MSS/TBM/*TBMvsnname* (the TBM dataset name). They are stored on IBM 4380 magnetic cartridges, and currently occupy the equivalent of 1,000 such cartridges. This cartridge space is needed for other data, so SCD is prompting the owners to move any files they wish to keep to their own directories, so that unneeded files can be purged. THESE FILES HAVE PASSED THEIR SCHEDULED PURGE DATE.

SCD will delay purging these files until the end of January. Meanwhile, SCD is making every attempt to contact the owners of all 14,000 files to urge them to move files they want to keep to the appropriate directory to avoid the purge.

Most of these 14,000 files have an associated user number, reflecting the file ownership on the TBM. SCD staff will arrange to send electronic mail on the IBM 4381 (IO) system to each user associated with a current, **valid** user number. If you have a login on the IBM 4381 (IO) system, please log on to that system over the next few weeks and check for mail messages regarding these MSS files. SCD staff will also be contacting users personally to remind them about these files.

If you receive notification that you are listed as the owner of one of these files, please check the files in question. SCD recommends that you immediately move any files you wish to keep to another MSS directory. If you have files that you no longer need, you can delete them yourself, or ask SCD to delete them for you by sending a list via electronic mail TO MARC on the IBM 4381 (IO) system. If you are incorrectly listed as the owner of someone else's files, or if you have questions about this process, please contact Marc Nelson at (303) 497-1262 as soon as possible. Files that have not been moved by the end of January will be purged.

MSS Charging Begins December 1

As of December 1, charges against GAU allocations will be made for use of the MSS.

For more information on job classes and charging, see the SCD document entitled "CRAY Series: CRAY X-MP and Data-related Charges," or the article on charging in the November 1986 issue of *The Record.*

SCD Advisory Panel Meeting Schedule

With the advent of the CRAY X-MP, the computing power available to SCD users has been enhanced by a factor of at least five. Large resource requests for this new machine will be considered at the next meeting of the SCD Advisory Panel, so now is the time to think about those big projects that have been waiting on the back burner because of lack of computing resources.

Requests for a total of more than five hours of central processor time on the CRAY-1A or the CRAY X-MP computers must be considered by the SCD Advisory Panel, which will meet April 6-7, 1987. University users must submit large requests to John Adams or Cicely Ridley of the Scientific Computing Division by January 23, 1987. Nine to ten weeks are needed for the preliminary review of requests and for the preparation, printing and distribution of Panel materials.

Documentation Update

SCD Documentation

"GETSRC, GETDOC, and AQPLMS on the NCAR CRAY Computers: Locally Developed Commands for Public Libraries," by Dick Valent. September 1986. This document replaces the GETSRC and GETDOC section of *The CRAY-1 Computers: A Guide to Supercomputing at NCAR.* It also describes a new command, AQPLMS, which is used to ACQUIRE UPDATE program libraries for the CRAY applications libraries maintained at NCAR.

"CRAY X-MP and Data-related Charges," by Pete Peterson. Version 1.1, revised November 1986. This version replaces Version 1.0.

"SEGLDR: The CRAY X-MP Segment Loader," by Brett Wayne. Version 1.1, revised November 1986. This version replaces the Consulting Office Document of the same title.

"VMSTA: Using the CRAY X-MP Interactively," by Nancy Dawson. Version 1.0, November 1986. This document describes how to use the NCAR-produced VMSTA EXEC for interactive access to the X-MP from the IBM 4381 (IO) front-end computer.

To order SCD documentation, send electronic mail TO MARYB on the IBM 4381 front-end computer, or call Mary Buck at (303) 497-1201. Allow two weeks for delivery. Users at the Mesa Laboratory can obtain SCD documentation from the bookshelves and black filing cabinet in the SCD User Area, Room 33, in the first basement.

Minutes of the SCD Users Group Meeting

October 27, 1986

Editor's Note: Due to the length of this meeting, the presentation by Joe Choy has been summarized, and the presentation by Dave Fulker on Unidata has been omitted, except for the questions from the audience and the reponses from Dave Fulker. However, a report on Unidata with diagrams and figures presented by Dave Fulker during the meeting is available from SCD. Please call the SCD Divisional Office at (303) 497-1205 if you would like a copy of the Unidata material.

Chairman Ray Bovet called the meeting to order and asked for corrections or additions to the September meeting minutes. On page 24, the sentence "Bailey then asked how the committee arrived at 2.5% ...," should read, "Rick Wolski then asked how the committee arrived at 2.5% ..." Noting the correction, the minutes were approved.

Ray Bovet mentioned that the procedure for editing the SCDUG Users Group Meeting minutes would be changed. In the past, Karen Hack gave them to Frieda Garcia for editing, but now Karen will send them directly to Ray. Ray may call upon others in the Users Group periodically to assist in the editing process. It was agreed that this was preferable to maintaining only a short summary of the minutes.

Report from SCD Acting Director - Margaret Drake

Margaret Drake (SCD) reported on the status of the CRAY X-MP. She expressed thanks to the users who are helping with the integration process, and commented that the X-MP is currently working fairly well, although its integration has not been too smooth. The connection to the Mass Storage System (MSS) is still weak and appears to fail about every six hours or so. There are also periodic failures in the connection to the NCAR Local Network (NLN). It appears that the only reasonably solid connection is through the VM station software. Because of the hardware instabilities SCD is currently asking users to run only in single processor mode. If there aren't any more surprises, SCD will still be on schedule and open the CRAY X-MP up to general users on November 2. *Editor's Note: The user access period was delayed for one week due in part to the problems listed above.* Margaret asked if Gene Schumacher (SCD) would like to add any comments. Gene stated that Systems did discover that on the CRAY X-MP the special I/O channels to allow talking to the Network Systems HYPERchannel box are not identical to the boxes on the CRAY-1A. SCD is now working on adjusting the code for the differences. The network remains stable for six hours and then will suffer a serious hangup. When it functions, it appears to transfer data just fine.

Margaret then asked if Gene Schumacher would address another uncertainty concerning the FORTRAN compiler being used. Gene said it is Version 1.15 on the CRAY X-MP. Margaret said that Paul Rotar had implied that it is not translating all code precisely as it does on the CRAY-1A. She felt SCD should check on that before opening the CRAY X-MP up to the general users. Greg Woods (HAO) asked whether users would be able to submit jobs in the normal way once the CRAY X-MP was made available to the public on November 2. Margaret replied yes, if things go well. Greg asked if the policy until then is for users to send at their own risk or would SCD prefer that they didn't send at all. Margaret replied that it would be at their own risk; they have selected 8 or 10 users who are helping to debug the system. Greg wondered if she wanted him to lock users out because the CRAY X-MP is logged on to HAO's VAX and there is nothing to stop users from using it unless he specifically turns it off. Margaret said her concern is that if they encounter real trouble they may bring the machine to its knees, and they won't receive any help because SCD is trying to concentrate on a few users to make sure that things stabilize. Greg thought HAO's test users were submitting from IO and wondered if they would like to submit from the VAX as a test. Margaret suggested that such tests be coordinated with the SCD Systems people because that kind of activity is very helpful.

Margaret Drake also mentioned that she had met with Rick Anthes, NCAR Director, and Bob MacQueen, NCAR Assistant Director, who are now beginning to analyze the Strategic Planning Committee's recommendations and determine what NCAR's response will be. There are two major areas that they want to immediately address. First, they want Margaret to devise an explicit plan for local area networking at NCAR and suggested that the SCD Users Group could be very helpful in that. The second topic is distributed computing at NCAR. Margaret stated that it appears NCAR management certainly wants to develop relationships with Unidata. They want to know how to help Unidata and exactly what the NCAR divisions would like to do with Unidata. She has heard from other division directors (Ed Zipser for example), who sees his own planning needs to be in one direction while AAP's go in another direction. Zipser feels they could be sharing facilities between divisions to get maximum advantage out of them. Rick Anthes urged Margaret to solicit input from users through SCDUG for assistance in developing a long-range NCAR-wide strategy plan in order to respond to the committee's recommendations.

Carl Mohr asked whether Paul Rotar had officially left SCD. Margaret said no. Rotar will be in Washington next week, return to NCAR for the week after, will be gone the following week, and then return for the week of Thanksgiving. He will be gone officially as of December 1. He is taking a leave of absence for one year, with an option to continue for another year. Bernie O'Lear of SCD will be Acting Manager of the SCD Systems Section. Ray Bovet wondered, as Paul Rotar will be overseeing supercomputing matters, if that might involve his coming back to NCAR from time to time. Margaret said that there is nothing specific in the plans. He will be in the Division of Advanced Scientific Computing and have responsibility for NSF's five supercomputing centers.

Suggestions and Problems

Ray Bovet asked Carol Fey Chatfield (ADM) from the NCAR Library to comment on her past problem regarding the inability to make a hard copy from the screen image onto a printer. Carol said she had her meeting with Dee Copelan (SCD) and Karon Kelly (ADM). However, the problem was not solved until Phylecia Brandley (SCD) came across it in reading the minutes of the SCDUG meeting in last month's issue of *The Record*. Phylecia notified Carol that the T command in the YTERM terminal emulation software can be used both on a terminal and on a PC to print out files at the printer.

Ray Bovet said there had been some questions at the previous meeting about the exact amount (between 8 and 30 terabits) of NOAA data to be transferred from the TBM. Margaret replied that it is simply a matter of how much money and resources can be devoted to it. If NASA comes through with some resources as promised then it is 8 terabits; any more is an uncertainty. Ray asked if this transfer has been going on while NCAR only has one CRAY. Margaret said yes, but the Operations staff has been monitoring its impact. Gene Schumacher (SCD) added that SCD has been shutting off the data hookup and had to shut it off a couple of times this weekend because of the enormous workload.

Paul Bailey (ACD) commented that he hasn't heard any official estimate of when the DICOMED would be handling GKS. He has heard that they are making considerable progress on it, that the translator is working and they are still working on the network interface and the titling, etc. Bob Lackman (SCD) said that John Humbrecht has been hired as a consultant to work with Lou Jones (SCD) to help get the titling going. John Humbrecht originally wrote the code, and will be starting this week. Ray asked if this work is directed at transferring control of the DICOMEDs to the IBM 4381 Mass Storage Control Processor, and Bob answered yes. Margaret asked if Bernie O'Lear could estimate when that will be a complete service. Bernie said he expects it will be February. Greg Woods (HAO) asked if that means that the CRAY will be generating metacode from the previous NCAR Graphics Package until then. Bernie said yes.

Ron Gilliland (HAO) had two questions. He said he tried to use the computer on Saturday and the residence time for files on the Cray disk was only about five minutes for very small files, while the acquire time for the same small files was up to an hour, so it was almost impossible to do any real computing. Bob Niffenegger added that they had some problems Saturday. Three users clogged the system and took 100% of all the disk storage on the machine between 9:00 a.m. and 4:00 p.m. They had to flush those users out of the machine. Secondly, there was another program that was so big they had to drop the MSS tape and some of the utilities programs to allow it to run.

Ron Gilliland said that he had a more serious problem this morning; a couple of MSS files disappeared that he had created about 10 days ago. He had acquired them over the weekend just fine but the response this morning was " file does not exist". Bob Niffenegger said they may have had a bad cartridge or something, and asked Ron to get the information to Gene Schumacher (SCD).

Kent Sieckman (ACD) asked what the current state of the C compiler is on the CRAY X-MP. It is his understanding that it is down while SCD negotiates a license. Margaret confirmed that there is a C compiler on the CRAY X-MP in support of the TCF package (Stu Patterson's multi-processor package). That license is under negotiation. Gene Schumacher added that it isn't in the library right now; it is on site on tape but not on the X-MP. Ray Bovet asked whether it is SCD's plan at this point to provide a C compiler for both machines for use other than in conjunction with TCF. Margaret said yes, once it's licensed for the machine, then it will be available. Ray suspects other divisions are interested in it as well. Margaret said the C compiler will be put on the CRAY machines when everyone is using UNICOS.

Rick Wolski (AAP) said he had a complaint from a user this morning who was trying to do some work on the CRAY-1A over the weekend. Some very long Foreground 2 jobs were having their priorities significantly raised. Bob Niffenegger (SCD) confirmed that. Rick asked if that was what he meant by flushing them out. Bob said that was correct. Rick said the concern expressed was that if this sort of policy continues once the new charging algorithm is implemented, people will be paying for higher priority without actually getting it. Bob said the only

other thing that could have been done that day was to drop the three jobs and they chose not to do that. Operations chose to stop the CRAY and try to find out what was causing the problem by running some tests; they wanted to figure out how to get those jobs through the machine, because they were doing nothing but rolling in and rolling out. A big problem was that many users were bringing up enormous amounts of data, using it and then not getting rid of it until the end of their program. Anyone that does that is not helping. The disk scrubber just can't get out there and remove it fast enough. About two months ago there were 15 users that all had Foreground 2 jobs with a field length over 730,000, which is about the maximum size. SCD notified users then that from time to time they would have to pull out the utilities and shut other things down to get jobs out, because some of them have been in the queue for four or five days. Even running Express class doesn't help. *Editor's Note: In response to this field length problem, SCD has reduced the maximum allowable field length on the CRAY,C1 computer from 791,000 to 650,000. Any jobs that exceed this limit will be dropped.*

Bob Nicol (SCD), who helps coordinate documentation for User Services, informed the Group that the Documentation Group would like to solicit users to volunteer and help provide user feedback, when requested by User Services. If anyone would like to volunteer, please contact him at (303) 497-1249.

Carl Mohr (CSD) wondered how long the TBM data converter software would be supported on the CRAY. Bernie O'Lear replied that users have two years to get their data converted on the CRAY-1; after that the CRAY-1 may be retired. Carl said that part of the problem is that the data looks like the old CDC 7600 PLIB tapes. CSD had some dedicated volumes and the data were just moved bit by bit; CSD was never given the option of asking SCD to convert data on the fly. Bernie said they couldn't have converted it on the fly, but they did have the option to move it themselves. Carl asked if the TBM converter would work on the CRAY X-MP. Gene Schumacher (SCD) said yes. Carl added that these are essentially archived data sets and CSD plans to convert them as users access them. Bernie said SCD is trying to get all data in a standard format.

Paul Bailey (ACD) said that Tektronix has announced a new line of terminals and improved some of their hardcopy devices. They will be at NCAR on November 10 to demonstrate some of their new products, like their high-end color copy device. The demonstration will be in the Directors Conference Room from 1-5 p.m., because this room has a PACX connection so users should be able to log onto their own computers and display their own plots, rather than look at something that an artist put together. Ray Bovet stressed that this is not a plug for Tektronix. If anyone wishes to announce demos of other vendors, they are free to do so.

Ethernet Gateways to NCAR Network - Joe Choy

Joe explained that the NCAR Local Network (NLN) basically supports the supercomputers (the CRAY machines), the Mass Storage System, the DICOMED processors, the high-speed printers and several front-end computers. The Ethernet network, on the other hand, supports just the front-end machines on several interactive user systems and also an internal DECnet network that runs among the VMS machines. That Ethernet also supports connections to users and the University Satellite Network (USAN), and a connection to NSF at the National Science Foundation network. Not all of the front-end systems are on the Ethernet and there has been a desire to be able to move to a common set of protocols that allow transparent methods for a user to transfer data and programs from their user systems and the CRAY systems through standard products protocols. SCD would also like to be able to provide access to any available interactive debugging capabilities, such as ICJOB.

Joe said that SCD recognizes the need for gateways to be able to connect from the NCAR Ethernet to the NLN, and that the gateway should be uniform in how it appears to the user and in its access for users to make use of the supercomputing facilities at NCAR, including the supercomputers, MSS, DICOMED, high-speed printers, and so on.

The "UCAR and NCAR Strategies in Supercomputing" report of the UCAR-NCAR Ad Hoc Committee on Strategic Planning of Computing Activities further emphasizes the need for gateways between the NLN and the Ethernet networks at UCAR. If the recommendations are fully accepted and implemented by UCAR and NCAR, then SCD and NCAR must plan to provide gateway services as mentioned earlier in order to provide these connections to get to the supercomputing facilities. There is such a gateway being planned but it is being funded through USAN and is specifically designated for USAN/NSFnet. It has been funded by the Office of Advanced Scientific Computing and has been designated for remote users to access, submit jobs to, and get output back from the CRAY computers. The users will work remotely on their work stations or local front-end machine, and with the standard set of ARPANET protocols, submit their jobs to the NCAR network and get their output back. Ideally SCD would like the gateways to be completely transparent and be efficient and effective. SCD's direction is to provide the transparency using standard products and standard hardware and interfaces. In order to do that, and to be able to run standard protocol all the way to the CRAY or other machines, the ARPANET protocols must be supported. ARPANET is available and continues to be enhanced on the UNICOS systems.

There are currently several gateways that exist between Ethernet and the HYPERchannel network. Specifically, HAO has a VAX running UNIX, SCD has a Pyramid running UNIX, and AAP has a VAX running VMS that supports DECnet users. Those users are able to submit jobs through AAP1. SCD strongly recommends that these gateways continue to be supported on an interim basis while they continue to plan and develop other connections to the NLN and the Ethernet to allow all users to directly access the CRAY computers. SCD would like to get some input from users because they don't currently have resources to apply to this type of project. SCD wants feedback in terms of a timeframe and other restrictions that are preventing divisions from just maintaining their current gateways until SCD is able to procure the appropriate resources in terms of both funds and personnel. One possible gateway SCD is considering is the IBM 4381 (IO) system.

NCAR-wide electronic mail is not possible in the current system. It does support FTP, but requires that passwords be known in order to send and receive. It does not support TFTP in both directions; TELENET works in line mode. It works in full-screen mode for VT100 terminals. SCD has very limited resources and has not been able to assign anyone to work on RJE support on the IBM 4381 (IO) system over Ethernet. Part of that will depend on the priorities and suggestions from the users, how quickly they need this and what things they can set aside in order to work on this possible gateway. Another complication is that the Data Defense Network (DDN), ARPANET, and NSFnet are developing an RJE protocol to run over TCP/IP. There is no exact time table. They want to work closely with SCD so that the protocol is supported. It will be a standard protocol by which anyone throughout NSFnet, ARPANET or the internet — the whole TCP/IP world — can submit jobs to any other machine using the same RJE protocols.

Within NCAR itself, SCD would also like to get some feedback from each of the divisions about how they would like to have the internal networks within NCAR managed and overseen. SCD would maintain its own network and the interconnections to its gateways, the network interconnections that it has to all the external networks to the outside world, and also the interfaces to each division. However, each division would essentially be running off its own subnetwork, and be separated from SCD through a bridge box to isolate traffic. The question for

each division is how much they want SCD to oversee and manage; will it end at the interface box or would they like support, assistance and consulting further into their own network. SCD needs to know that in order to plan for appropriate personnel and resources.

Question & Answer Session on Joe Choy's Presentation

Ray Bovet asked how much the Sun-3 for USAN cost. Joe said it is the new Sun-3/280 with 16 megabytes of memory and was in the low $80,000 range. Ray asked if something in that capacity would be an adequate front-end or be able to handle all of the NCAR internal traffic. Joe answered there are other things that it does besides RJE. It will handle a domain name server. For mailing it has a central name server for all of USAN and NSF sites. It handles a special BBN diamond multimedia mailer and many other things. It also is not guaranteed to be a production machine, since it was purchased as part of the USAN experimental project. It is also there to do network research on and would not serve well in a production environment. Ray wondered how much it would cost to buy a machine that would serve this function well for the NCAR divisions.

Rick Wolski (AAP) asked, in terms of time and manpower and money, how much it would take to get equal functionality out of the IBM 4381 (IO) machine. Joe said it depends upon what type of functionality. If functionality similar to the current implementation on the SCD Pyramid and HAO VAX is desired, then there are problems: in the Spartacus software and hardware that provides a TCP/IP link on the IBM 4381 (IO) system, electronic mail isn't working and the staff at Spartacus found out that they had never had it working in this version. SCD is actively working with them remotely to try to get it to work. There are no guarantees that SCD could use the IBM 4381 like the Pyramid and the VAXs are used today because of the mail problem.

Carl Mohr (CSD) said that if it requires more than two FTEs to get this functionality working on the IBM 4381, NCAR is losing money and should just get a Sun workstation to do it. He recommends that SCD back off from putting too many resources into the IBM 4381 when it is obviously easier and probably cleaner to do it by duplicating the Sun station. Joe Choy said access must be provided to the IBM 4381 for local users and remote users who use it as a front-end and that is mostly to support TELENET with full-screen capabilities and FTP. Ray Bovet said if they are already on a computer that would be talking TCP/IP, they may not be that interested in accessing the front-end capabilities of the IBM 4381, and he is not sure that SCD has to make the TCP/IP connection work easily for everyone on the machine. He would rather support spending $80,000 to buy another Sun. Joe said that, for the local users at NCAR, that may be true, but there are many external users who use the IBM and need those facilities. Ray said if they just have a terminal that's not talking TCP/IP and want to talk to the IBM 4381, they can dial up through TELENET. If they have TCP/IP their machine is probably capable enough to serve as their own front-end. Joe said there are many users who are running PCs that can't handle that and they prefer to work inside their local environment. A number of the USAN sites are doing that. Carl Mohr wondered if the facilities would be needed if users have the capability to come in through a workstation. Joe said that the best that many universities and individuals can afford is a PC. Then there are some who use a terminal on a machine that comes through NSFnet, and they don't want to work in their local environment and are used to the IBM 4381 and its CMS environment. There is more throughput capacity on this network than on the TELENET; on TELENET most users are restricted to 1200 baud or 2400 baud. SCD is talking about a much higher bandwidth connection with full screen support. Ray surmised that it's SCD's job to coordinate the demands of outside and inside users, but there is certainly a demand from the inside users to have a convenient way to access the NCAR machines. Joe said part of the reason why the ARPANET

gateway that was selected for the USAN project has a lot of disks on it is because there are two protocols and it is a store-and-forward machine. Adequate space must be provided to do that because of the size of some of the jobs. It will be performing many tasks that will also support a connection to the ARPANET at 56 kilobits per second, so that is why it has several output memory paths in order to minimize the amount of paging that is done. Ray stated, for the record, that he will support an SCD decision to spend $80,000 on another Sun. Joe said that it is not another $80,000. The current Sun is funded totally by OASC and was designated for that purpose by OASC.

Ray Bovet said Chuck D'Ambra (ASP) was involved in writing a memo as a result of a meeting with some NCAR in-house sites requesting a gateway machine of this sort. That memo was sent to SCD and Ray wondered if he has gotten a response. Chuck said he's getting a response right now. Ray's impression is that SCD will be happy to provide this if money is available. Joe said, if appropriate input from all the divisions suggest it is a high enough priority, and SCD can get the resources and appropriate personnel, yes. Chuck D'Ambra added that he also will support an SCD decision to purchase another Sun-3 with a similar configuration to what is being purchased for USAN/NSFnet, as it would minimize a lot of duplication effort. He wondered if that will give NCAR the capability, if one of these machines were down, to use the other one to service both inside and outside traffic? Joe said that it probably will.

Ray Bovet said that, when Chuck's memo was written, there was some question about the NCAR sites that were running VMS and hence were talking DECnet rather than TCP/IP. Since that time, SUN has announced support for DECnet on their machines so that a machine serving as a gateway for the UNIX machines could, with adequate software, be similar in function to VMS. Joe said there are other complications; as the network is configured, each of the individual divisions go through a bridge box. Between NCAR's internal networks and the external networks there is an IP router box that will not allow passthrough of DECnet protocols at this time. Therefore, the configuration for the AAP machines is to sit over on the USAN network to allow them to access their history. Joe said that the gateway machine will be between NCAR's local Ethernet and the NLN. Ray felt that buying TCP/IP software for the VMS machines makes sense.

Ray Bovet asked what can be done to have the SCD Users Group give input to Rick Anthes on local networking at NCAR. Margaret Drake said that Rick Anthes is asking for a long-term strategy for how to manage and who is to manage the local area network at NCAR. He would like immediate involvement of the divisions in the planning of this and would like to use this users group to get input. Ray asked if a committee should be formed. Paul Bailey (ACD) said there already has been two meetings of a group of interested people, which is a fairly large subset of the SCD Users Group. Paul added that there is no problem in augmenting the group. It is a matter of finding out what the needs are, the time frame, and setting up a schedule to work on it. Margaret said that the Group certainly would be ample for the technical part of this problem. The other part is user recommendation for management. Paul said it must be defined first. Ray suggested that he and Margaret meet with Rick Anthes and Bob MacQueen. Joe Choy added that the committee Paul refers to was formed out of a need and didn't report to anyone; it was informal. Margaret said that it may change after a meeting with Rick Anthes.

Bob Nicol (SCD) pointed out that not having an interactive central machine that everyone can access causes SCD serious problems as well. SCD would like to be able to disseminate information to everyone from one central location. The documentation staff has been evaluating online documentation usability over the past few years to come up with some kind of plan that will work. Bob stated that there seems to be a need for a central interactive machine that

everyone can access, not only NCAR local people but also remote users. Ray Bovet said he's not sure a central interactive machine is needed. He sees SCD's role as not so much providing the central interactive machine as the networking so that everyone can communicate. In the past, SCD could assume that users would come in on the IO machine, and that was the place where everything resided. NCAR doesn't need just a replacement of the IO machine; now it needs to communicate with whatever machines the universities have. There probably does need to be a central place for getting the documentation. Carl Mohr said it's just one more node on the network. Paul Bailey asked, which network. Ray said it has to be the TCP/IP Ethernet-type networks, because that's clearly the direction of the future. That is why TCP/IP is needed on the IBM 4381 system. Margaret said SCD may not need the front-end services that it currently provides, but it may need others. Carol Fey Chatfield (ADM) added that the library is currently developing a system for on-line querying of the library's catalog, which needs to be centrally accessible by local NCAR users or through remote logins. She recommends that the IBM 4381 be seen as a gateway and be on Ethernet, and doesn't want to see its status on the network downplayed.

Summary of the UNIDATA Project Presentation - Dave Fulker

Dave Fulker (UCAR) gave a history of Unidata, summarized the system wiring diagram, and concluded with current experiences using the network file system. He augmented his talk with some overhead diagrams. These diagrams and other information on Unidata are available from SCD (see the note at the beginning of these minutes).

Fulker Presentation (Question and Answer Period)

Paul Bailey (ACD) asked Fulker if there are any mistakes to avoid as people get together in groups to discuss a response to the request by Rick Anthes in order to ensure compatibility with Unidata. Dave said he doesn't think he has anything to add; everything said today seems entirely compatible with the directions that they have set. Rick Anthes has himself indicated a willingness to work with Unidata to try to ensure compatibility. The front-end systems mentioned certainly fit into the plan.

Ray Bovet (HAO) asked how far away NFS is for the CRAY X-MP and if it depends on UNICOS. Joe Choy said, definitely, because it runs on top of the TCP/IP. Ray said he hears that CRAY is working on something. Joe Choy replied that TCP/IP is basically operational on UNICOS right now. Dave said it's encouraging that Sun has a strong program of working on front-end support with CRAY, and is sure that Sun has that network file system model in mind. Joe Choy said there is other work being done by other universities to provide NFS on other machines. Rensselaer Polytechnical Institute is working on NFS on the CMS machine, but it is more of a university graduate project. Ray said many files at NCAR are stored on the Mass Storage System, which is not running CMS. Joe said it runs MVS. Ray asked if someone is working on NFS for MVS machines. Joe said not that he is aware. Dave Fulker said the principal sources for IBM software that he knows about that are at all network-oriented are Spartacus, the suppliers of the software package that is being brought up on the system, and the University of Wisconsin Computer Science Dept., which has been working on IBM networking. Ray said there are a certain number of data sets that are on CRAY disks. The bulk of everything here is done with the MSS. Dave said one might want to think of the MSS as a file server to both the CRAY and to the outside world. Joe Choy said there is much more work involved than just the MSS. There has to be access to a sub-machine, extra processing power and other resources to support the NFS site. Ray Bovet added that data format conversion on the fly is also needed.

Dave Fulker said that some of these things are, in fact, practical within a reasonable time frame, and NFS support on a front-end machine might be very useful. Good support under VMS for the network file system will probably be available through one source or another within the year. There is already good support for the IBM PCs available. Joe Choy said the SCD Pyramid will be up on NFS in about two months.

Ray thinks it is highly desirable to be able to just access files. Dave said the real question is at what point does it make sense to move whole files, or to access pieces of them. If one is accessing pieces, what is the actual paging mechanism; does one bring a page out and do a subset selection on that page before sending it across the network, or does one do all the selection on the other side? Considering the differences in speeds and data set sizes used on the CRAY and workstations, Dave doesn't think anyone has enough experience to really know how to do it. The question is harder for outside users than for local users, because there will always be substantial, probably an order of magnitude, differences in speed between the local connections and the long distance ones.

Carl Mohr (CSD) asked what the individual divisions at NCAR can do to support Unidata. He asked if Unidata should take a leadership role or if there are things that can be done to expedite it. Dave Fulker said he has to answer the question in two ways. First, SCD is handling some of the networking development that is being funded outside of the atmospheric sciences by OASC. He thinks this effort is very important and should be pursued with all vigor because to be a full-fledged partner in NSFnet, the RJE protocols need to be moving in the direction of the protocol standard. In order to be a leader in that area, it is very important for SCD to be playing that role in the community, and it will also put it in good standing with the National Science Foundation, which will be very helpful to Unidata. Unidata is not building its own network; it is relying on NSFnet efforts and on the SCD efforts. He emphasized how important it is for SCD to take an aggressive posture towards networking. The other side of the question is how the scientific divisions might help and participate in this. Until there is a good consistent solution to the local data mangement problem, which is consistent with the three classes of workstations, Unidata cannot proceed into the applications area. Most of the developments needed now are pre-computer oriented. Dave is engaging a commercial firm to help with the real-time aspects of this problem. NCAR should become a full-fledged participant as the program moves into the applications area and Unidata systems are used for accessing the supercomputers--about a year away.

Ray Bovet (HAO) asked how useful Unidata might be for users who aren't running meteorological earth-based atmospheric research. He felt that certain aspects would be very valuable for users in HAO, even though they're not so interested in lower atmosphere research. Dave said that the single most important contribution is at the infrastructure level, but Unidata follows the notion that users should have their own computing resources. The relationship between those local computing resources and the specialized resources, which Dave likes to think of as services on the network, needs to evolve and work. That concept is completely independent of the particular discipline, or even the particular applications. The concept was for Unidata to help make the mode of operation to be more the standard mode and to get the kind of support it needs to be fully functional.

Dave believes that forms of interactive graphics are going to play key roles in this effort. Graphics products should probably be able to handle raster images as well as more vector-oriented images. One may also need to control various attributes of the graph in an interactive way in order to highlight certain aspects, as well as having the capability to redraw graphics on the workstation. The relationship between the graphics package on the workstation and graphics support in the supercomputer needs active exploration. He believes SCD is

looking into some possible external support for that effort. Unidata may help stimulate that and perhaps that will eventually be a productive area for scientific involvement in the program. Those developments in the graphics area and the ability to represent slices of the atmosphere or slices of the model seem to be application independent, and he thinks those are important areas for development.

Future Agenda

The next SCD Users Group meeting will be on Monday, November 17, 1986, at 1:30 in the Damon Room.

Summary of Daily Bulletin Items

CRAY Computers

November 4, 1986
AMENDED ITEM FOR CRAY USERS: If you are using SEGLDR or LDR for jobs to run on the CRAY,CX, or SEGLDR for jobs to run on CRAY,C1, the loading sequence has been changed so that $NCARLB is loaded last rather than first. This may affect programs that use the NCAR graphics package. To avoid the potential naming conflict, use LIB=$NCARLB:

```
SEGLDR,CMD='LIB=$NCARLB'.
LDR=LIB=$NCARLB.
```

November 10, 1986

CRAY,CX NEW USERS: should read the information found by typing

```
help xmpchang
```

on the IBM 4381 (IO) front-end computer. This file contains information about necessary changes to your job structure, such as the ACCOUNT card and the revised job classes. (The same information is in the SCD document, "CRAY Series: Changing Your Job to Run on the CRAY X-MP.")

CRAY,CX NEWS FILE: has been created on the IBM 4381 front-end computer for CX announcements that are of long-term interest. To access this file, type

```
news xmp
```

To submit an item for the file, contact Barbara Horner-Miller at (303) 497-1283 or send electronic mail TO HORNER. A version of this file suitable for printing exists as

```
xmp print
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on the NCARLIBS 480 disk.

November 11, 1986
CRAY,CX EXPRESS 2 CLASS: jobs have been limited to 5 mins.

IBM 4381 (IO) Front-end Computer

October 21, 1986
IBM 4381 USERS: To read back copies of the Daily Bulletin, type

dailyarc

It contains Daily Bulletins for the last month or since the last publication of The Record.

November 10, 1986
IBM 4381 FRONT-END (IO) COMPUTER: installation of release 4.0 of CP took place Mon., Nov. 10 at 08:00. Users should not be affected.

Software

November 10, 1986
DICOMED USERS: Due to various problems, 35 MM jobs were lost starting Sun., Nov. 9 at 08:00. The problem will be investigated today.

November 12, 1986
DICOMED USERS: All 35 MM jobs were lost after 24:00 on Tues., Nov. 11. No 35 MM jobs can be run at this time. The problems are being investigated.

November 14, 1986
DICOMED USERS: The 35 MM camera was returned to service today, Nov. 14, at 00:30.

Miscellaneous

October 30, 1986
DOCUMENTATION CORRECTION: The correct priority factor for Background 1 and Background 2 Job Classes is as follows:

Background 1	0.40
Background 2	0.33

This information is correct in the upcoming Nov. Record article, but it is incorrect in "CRAY Series: CRAY X-MP and Data-related Charges," Version 1. Please correct the documentation at your site.

November 5, 1986
SPECIAL CRAY X-MP CONSULTING: starts Mon., Nov 10 and lasts through the X-MP acceptance period. A consultant will be available to answer your X-MP questions in Room 17C of the Mesa Lab. The hours are 09:30-11:30 and 13:00-15:00. Regular consulting will continue to be available by phone at (303) 497-1278, or by appointment.

Computer Resources Allocated in October 1986

SCIENTIST	PROJECT TITLE	GAU	
		Request	Alloc.
Mary Cairns McCoy Colorado State University	Numerical modeling of mesoscale severe weather circulations	10.0	10.0
John E. Walsh University of Illinois	CFM snow cover sensitivity tests	3.0	3.0
Peter S. Ray Florida State University	Modeling of mountain thunderstorms	10.0	10.0
James R. Holton University of Wisconsin	Stratospheric general circulation modeling	10.0	10.0
Eugene S. Takle Iowa State University	Finite element boundary layer model	4.5	4.5
Ken-Ichi Nishikawa Paul B. Dusenbery University of Iowa University of Colorado	Wave/particle interactions in the plasma sheet -- a simulation study	10.0	10.0
Janet G. Luhmann UCLA	Lower thermosphere dynamics at high latitudes	3.6	3.6

Note: A request may be supported at a lower level than requested because:

a. It exceeds the five-hour limit above which Panel review is required; or

b. Reviewers consider the amount of time requested to be excessive.

Summary of NCAR Computer Use for October 1986

CRAY,CA COMPUTER

	October		FISCAL YTD	
	Total	Day Avg.	Total	Day Avg.
Clock Hours in the Month	7.92	0.255	7.92	0.255
less Scheduled PM	0.00	0.000	0.00	0.000
less Hardware Downtime	0.00	0.000	0.00	0.000
less Software Downtime	0.00	0.000	0.00	0.000
less Environmental Downtime	0.00	0.000	0.00	0.000
less Operations Use	0.00	0.000	0.00	0.000
less Other Causes	0.00	0.000	0.00	0.000
Clock Hours Up	7.92	0.255	7.92	0.255
less Systems Checkout	0.00	0.000	0.00	0.000
Clock Hours Avail. to Users	7.92	0.255	7.92	0.255
less Idle Time	0.13	0.004	0.13	0.004
Clock Hours in Use	7.79	0.251	7.79	0.251
% Available Hours Used	98.36 %		98.36 %	

CRAY,C1 COMPUTER

	October		FISCAL YTD	
	Total	Day Avg.	Total	Day Avg.
Clock Hours in the Month	744.00	24.000	744.00	24.000
less Scheduled PM	17.40	0.561	17.40	0.561
less Hardware Downtime	4.50	0.145	4.50	0.145
less Software Downtime	1.93	0.062	1.93	0.062
less Environmental Downtime	0.97	0.031	0.97	0.031
less Operations Use	0.70	0.023	0.70	0.023
less Other Causes	0.35	0.011	0.35	0.011
Clock Hours Up	718.15	23.166	718.15	23.166
less Systems Checkout	1.77	0.057	1.77	0.057
Clock Hours Avail. to Users	716.38	23.109	716.38	23.109
less Idle Time	1.38	0.045	1.38	0.045
Clock Hours in Use	715.00	23.065	715.00	23.065
% Available Hours Used	99.81 %		99.81 %	

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The Record

Issued by the
National Center for Atmospheric Research
Scientific Computing Division
P. O. Box 3000
Boulder, Colorado 80307

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